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Hongquan et al.

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(54) **RETRACTABLE UTILITY KNIFE**

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B26B 5/00 (2006.01)

(52) **U.S. Cl.**
CPC .. **B26B 5/001** (2013.01); **B26B 1/08** (2013.01)

(58) **Field of Classification Search**

CPC B26B 1/02; B26B 1/08; B26B 5/003
USPC 30/151, 155, 156, 162
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|-------------------|---------|--------------------|--------|
| 4,713,885 A * | 12/1987 | Keklak et al. | 30/162 |
| 5,101,564 A * | 4/1992 | Melter | 30/319 |
| 5,355,588 A * | 10/1994 | Brandenburg et al. | 30/319 |
| 6,148,520 A * | 11/2000 | Berns | 30/2 |
| 6,557,262 B1 * | 5/2003 | Clemence et al. | 30/156 |
| 6,898,858 B1 * | 5/2005 | Spell | 30/512 |
| 7,520,059 B2 | 4/2009 | Ranieri et al. | |
| 7,765,701 B2 * | 8/2010 | Okada | 30/162 |
| 7,797,836 B2 | 9/2010 | Ranieri et al. | |
| 8,056,241 B2 * | 11/2011 | Davis et al. | 30/162 |
| 8,353,109 B2 * | 1/2013 | Rohrbach | 30/162 |
| 8,561,305 B2 * | 10/2013 | Davis et al. | 30/162 |
| 8,707,566 B2 * | 4/2014 | Rohrbach | 30/162 |
| 8,752,297 B2 * | 6/2014 | Rohrbach | 30/158 |
| 8,776,380 B1 * | 7/2014 | Quimby et al. | 30/155 |
| 2003/0154606 A1 * | 8/2003 | Saunders et al. | 30/162 |
| 2004/0237312 A1 * | 12/2004 | Hernandez et al. | 30/162 |
| 2009/0260235 A1 * | 10/2009 | Rohrbach | 30/162 |

(Continued)

FOREIGN PATENT DOCUMENTS

DE 30 32 688 A1 * 3/1981
EP 2 641 705 * 9/2013

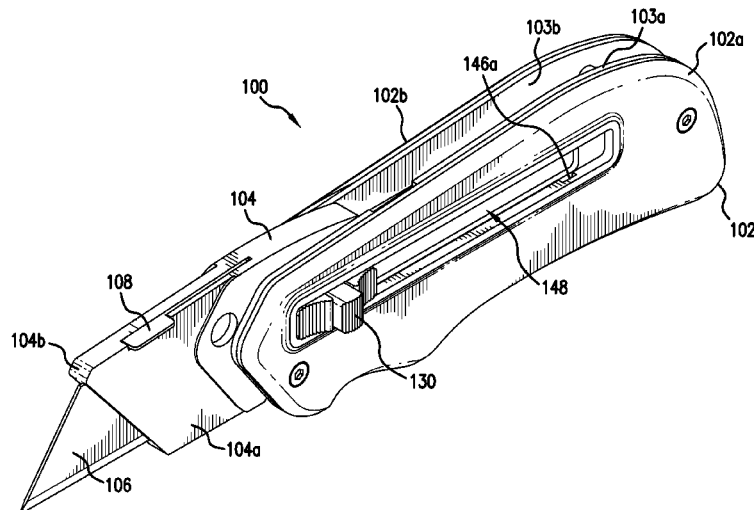
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Shuttleworth & Ingersoll, PLC

(57) **ABSTRACT**

A utility knife has a handle and a blade holder that holds a utility blade for selective removal and replacement of the utility blade. The blade holder is pivotally carried by the handle for pivotal movement in an arcuate path relative to the handle between a retracted position and an extended position.

11 Claims, 8 Drawing Sheets



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(56)

References Cited

| | | | | | | | |
|-----------------------|---------|----------------|--------|---------------------|--------|----------------------|---------|
| U.S. PATENT DOCUMENTS | | | | 2012/0234218 A1 * | 9/2012 | Martin | 111/118 |
| | | | | 2013/0061476 A1 * | 3/2013 | Lutgen et al. | 30/151 |
| | | | | 2013/0247382 A1 * | 9/2013 | Hongquan et al. | 30/156 |
| 2010/0325899 A1 | 12/2010 | Seber et al. | | | | | |
| 2011/0035947 A1 * | 2/2011 | Rohrbach | 30/162 | * cited by examiner | | | |

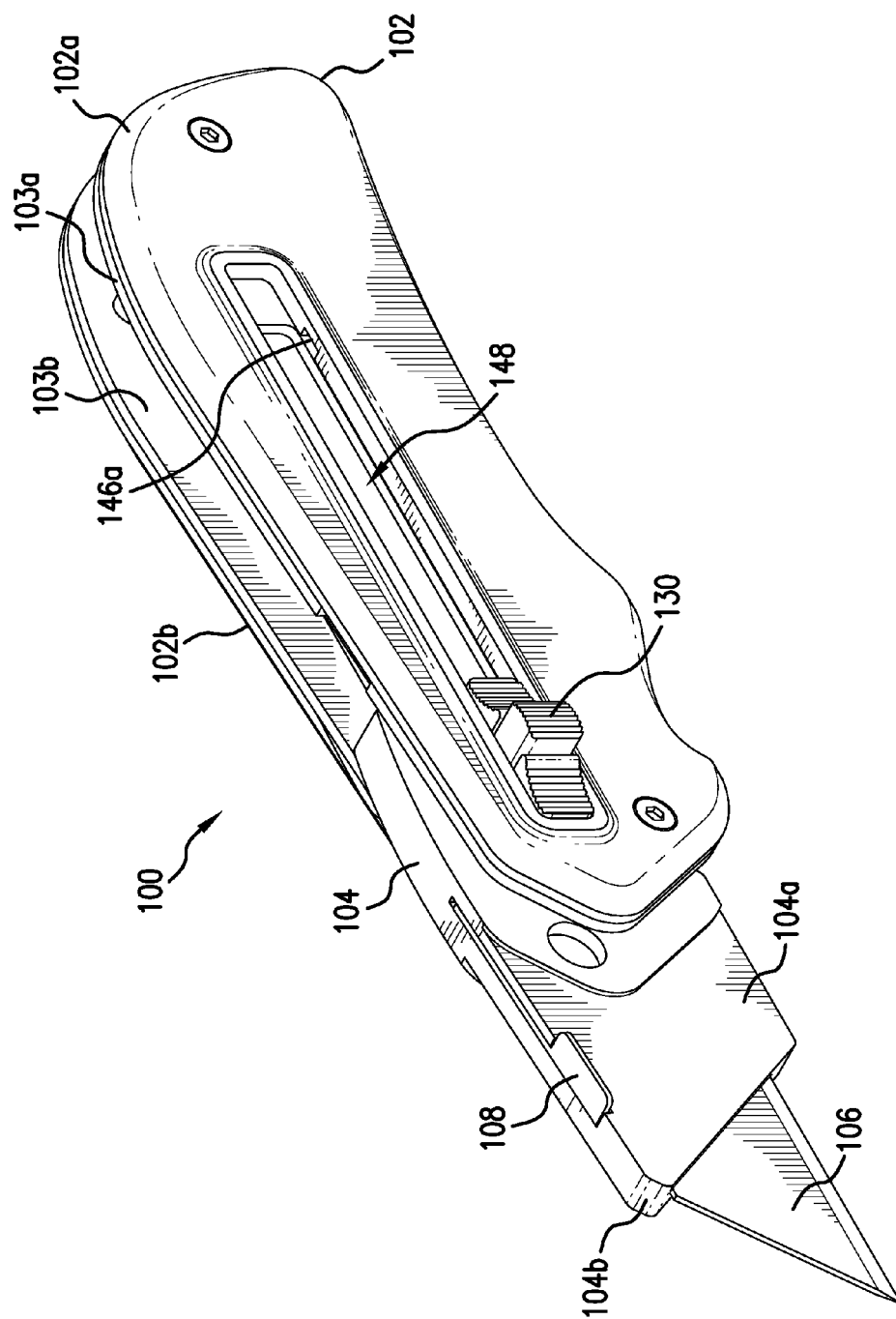


FIG. 1

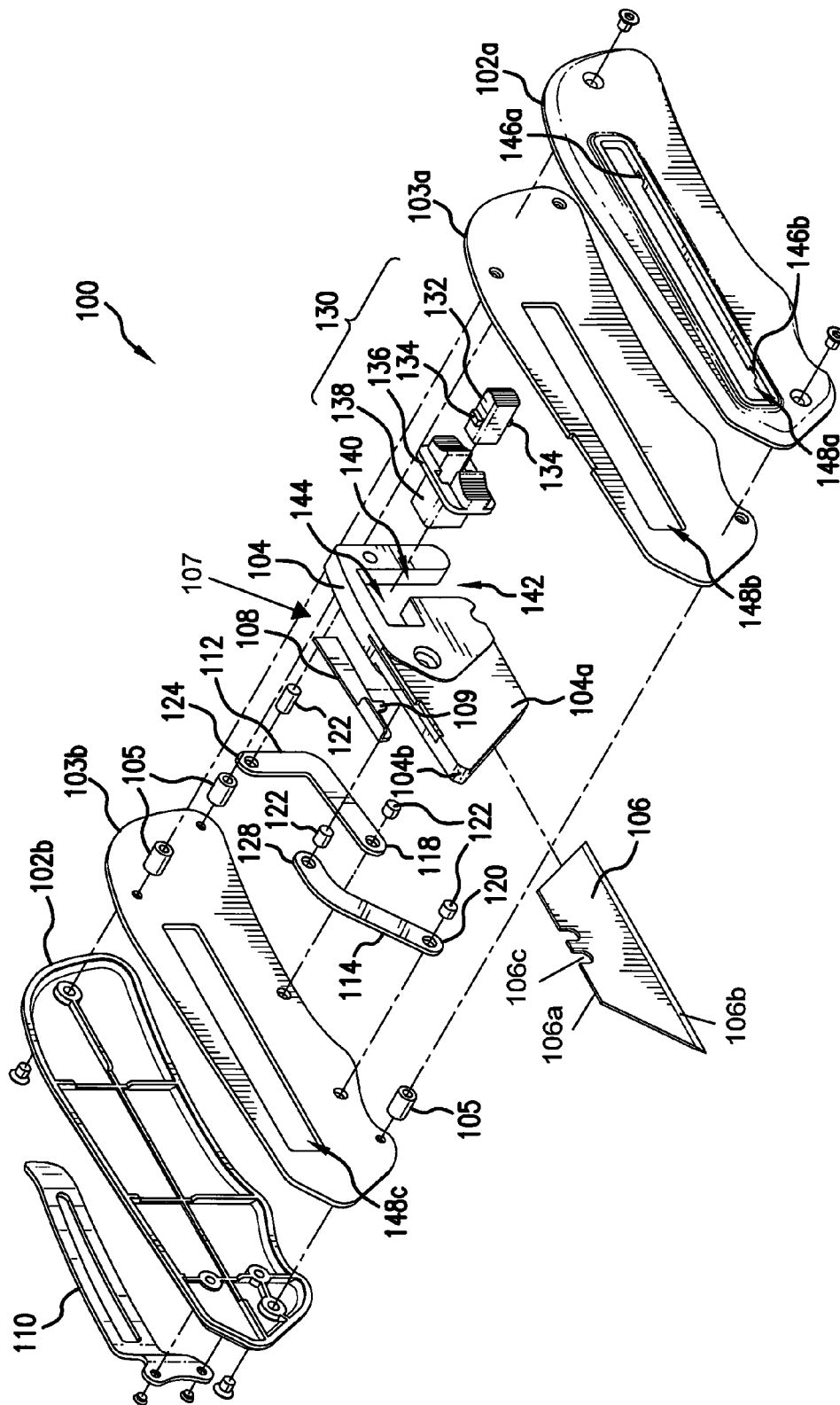


FIG. 2

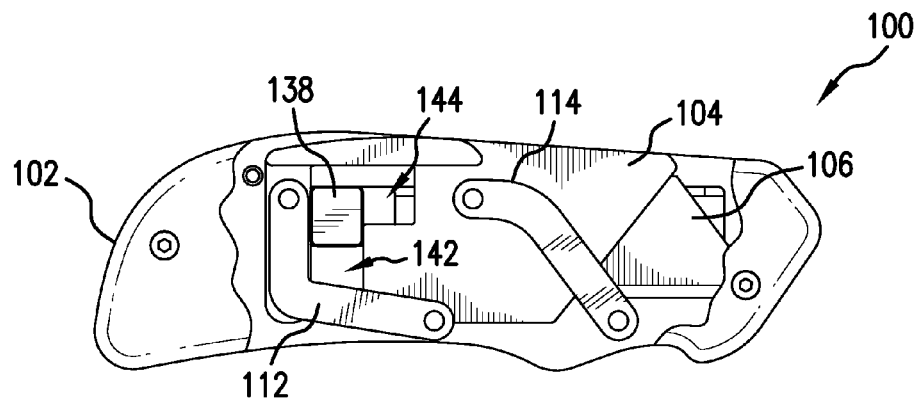


FIG. 3A

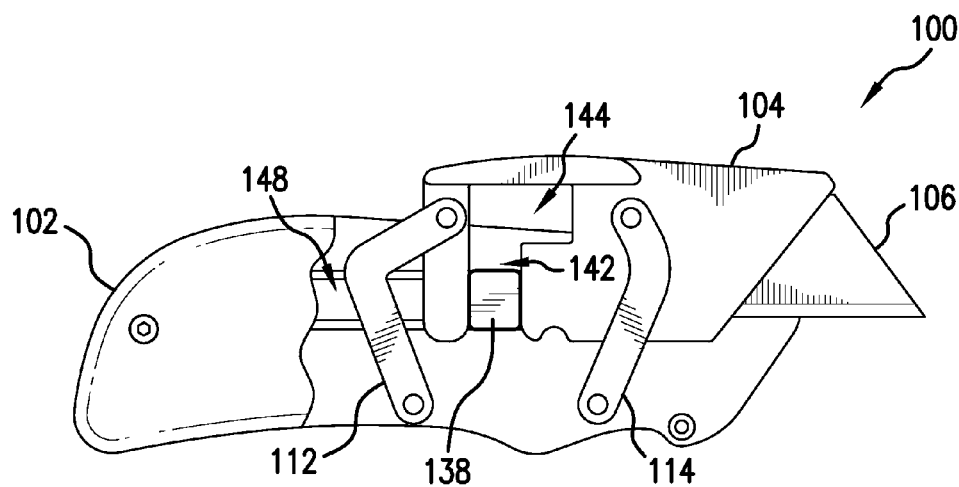


FIG. 3B

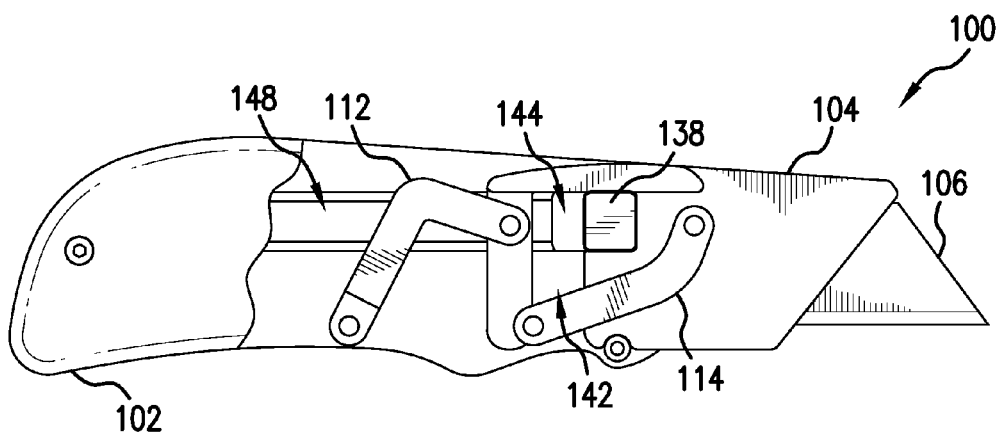


FIG. 3C

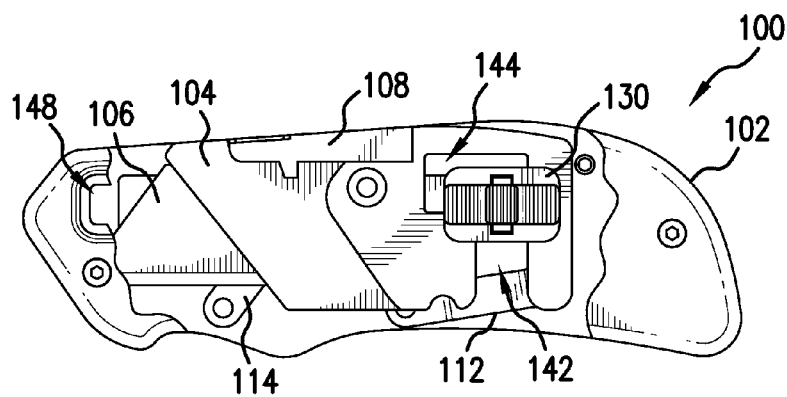


FIG. 4A

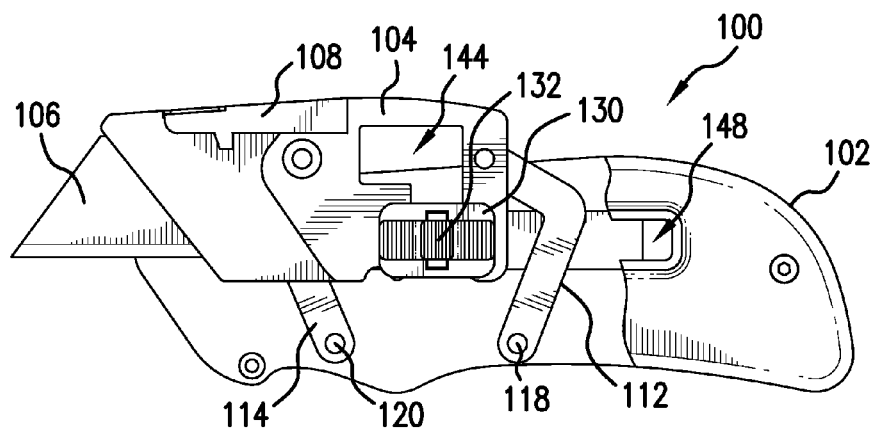


FIG. 4B

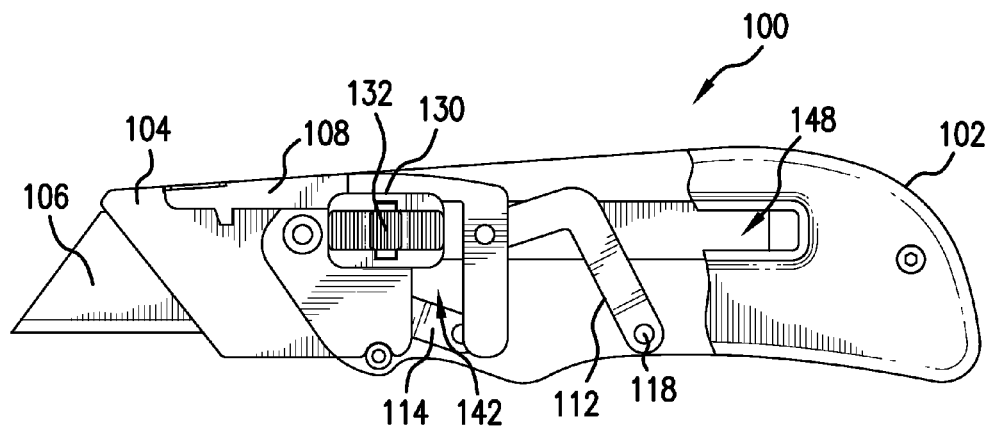


FIG. 4C

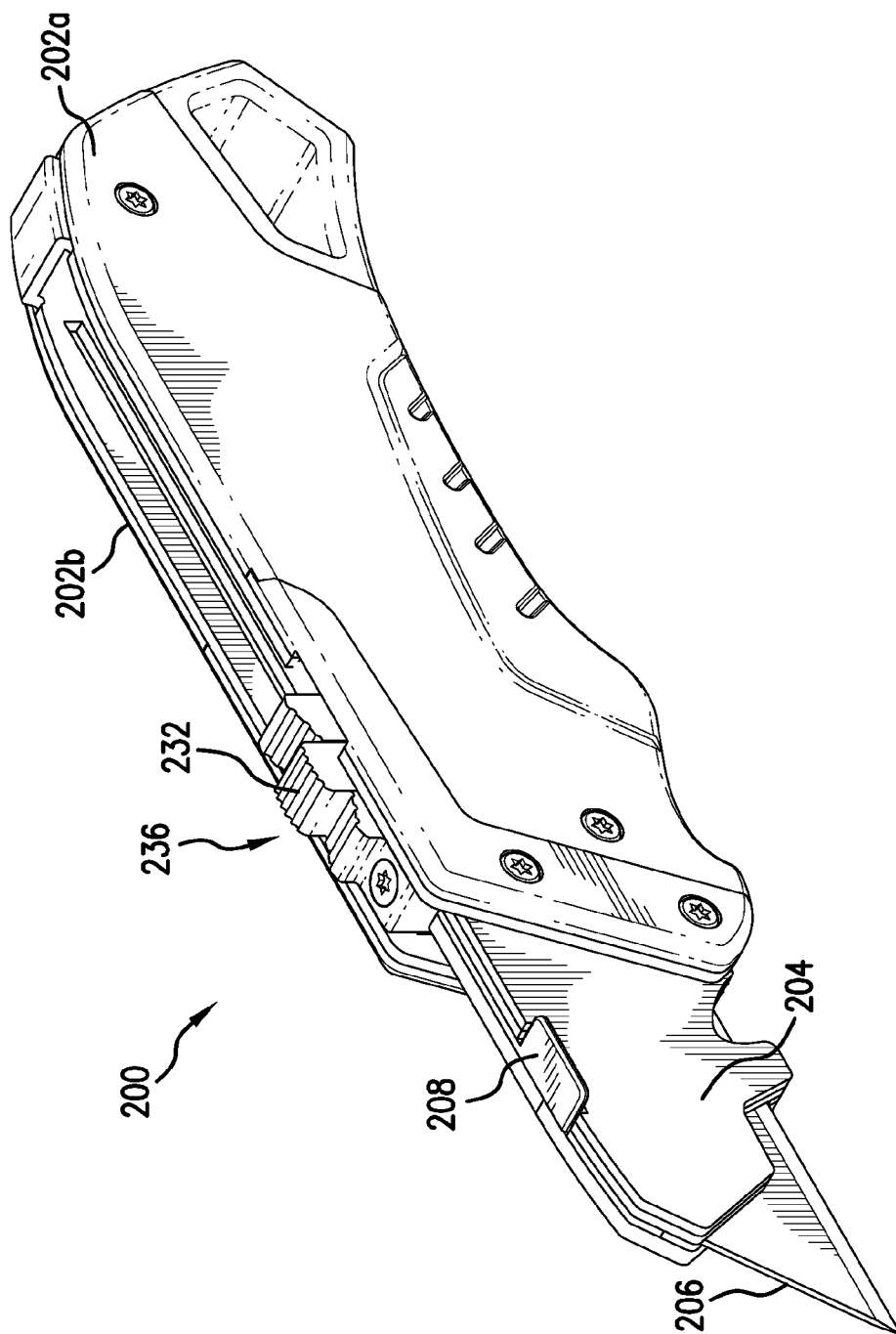


FIG. 5

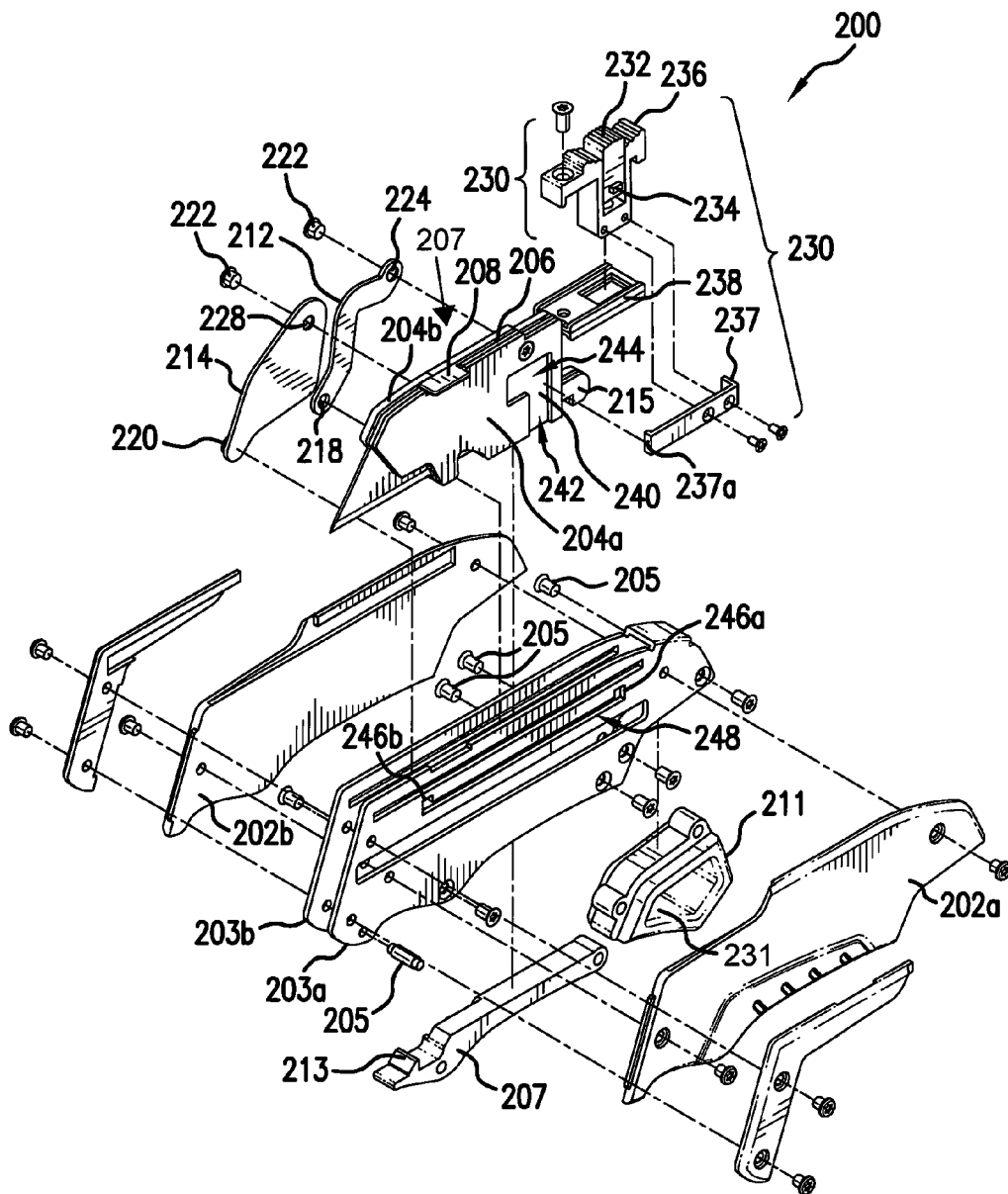


FIG.6

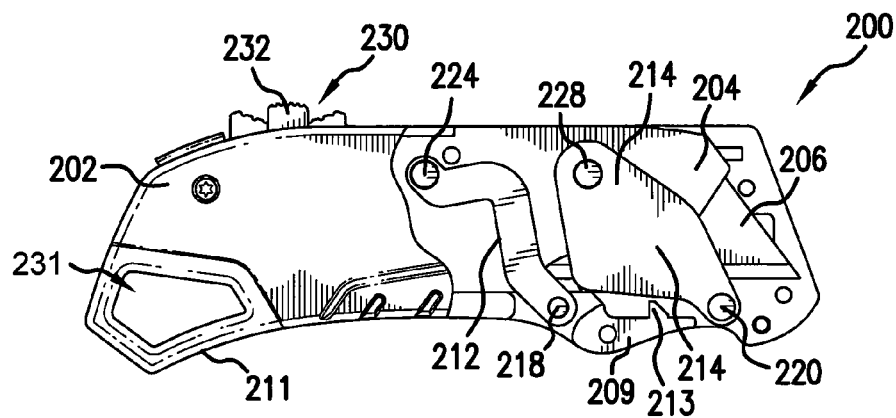


FIG. 7A

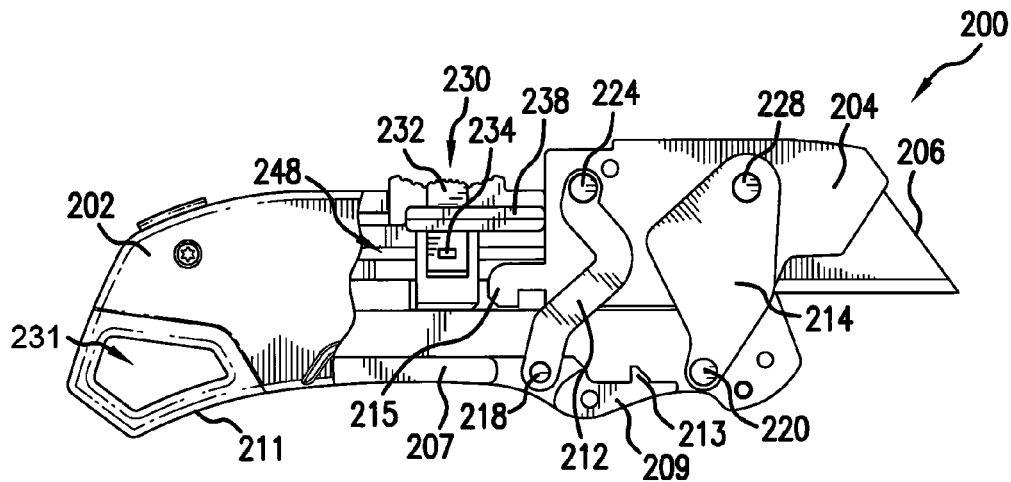


FIG. 7B

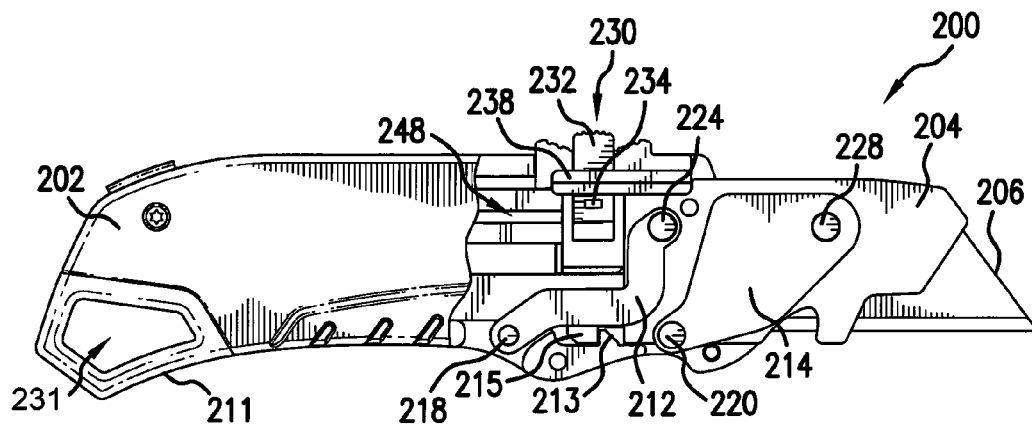


FIG. 7C

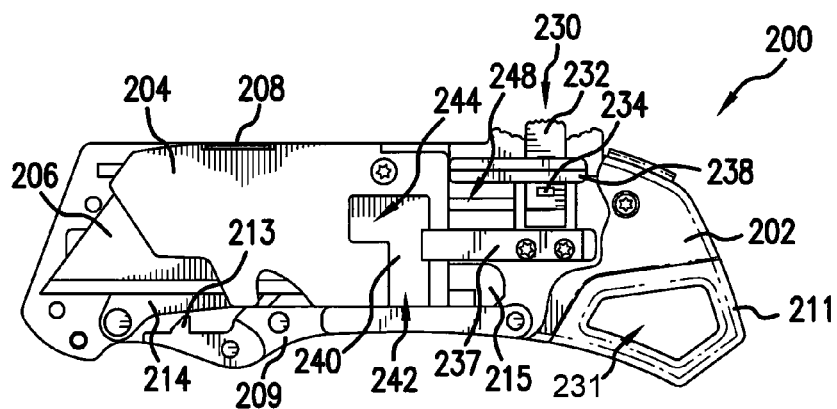


FIG. 8A

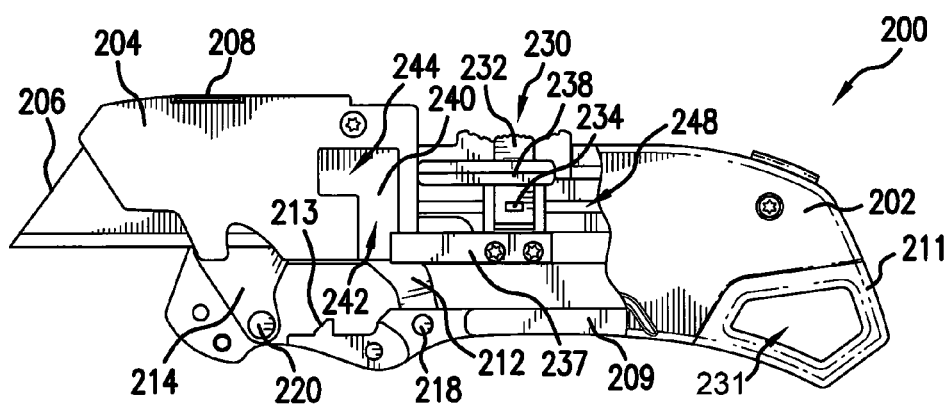


FIG. 8B

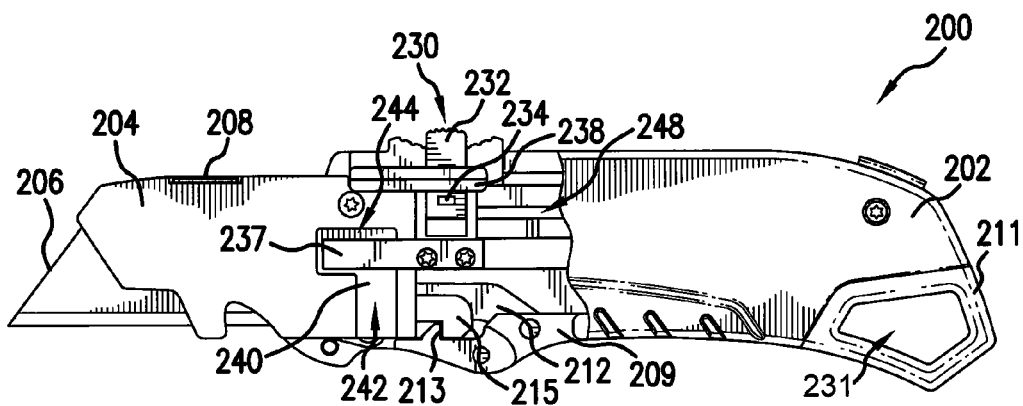


FIG. 8C

RETRACTABLE UTILITY KNIFE

This application claims priority to the following applications:

U.S. Provisional Application 61/614,890 filed Mar. 23, 2012

Chinese Application 201210364392.0 filed Sep. 26, 2012

Chinese Application 201220495738.6 filed Sep. 26, 2012

Chinese Application 201310080788.7 filed Mar. 14, 2013

Chinese Application 201320115044.x filed Mar. 14, 2013

The entirety of all five applications are incorporated by reference herein.

FIELD OF THE INVENTION

This invention relates to a utility knives and more specifically to utility knives with a retractable blade.

BACKGROUND

A conventional utility knife includes a long handle with a blade holder slideably disposed within the handle. A trapezoidal utility blade detachably mounts to the blade holder. A standard trapezoidal blade has a cutting edge disposed on its longest edge and one or more mounting notches disposed on an opposite edge. When the blade holder is in a retracted position, the blade is disposed within and protected by the handle. When the blade holder is moved into an extended position, a small portion of the blade becomes exposed. The conventional handle is relatively long so as to provide enough longitudinal space for a users hand to supply sufficient leverage to the blade during a cutting action or to enable the user to grip the handle without being overly close to the blade's cutting edge. Unfortunately, the length and size of this handle makes the utility knife large and cumbersome when the knife is not being used.

SUMMARY

A utility knife is disclosed. The utility knife has a handle and a blade holder that holds a utility blade for selective removal and replacement of the utility blade. The blade holder is pivotally carried by the handle for pivotal movement in a curvilinear path relative to the handle between a retracted position and an extended position. In the extended position, the blade holder projects from an aperture in a front side of the utility knife. As the blade moves in its curvilinear path, the blade holder can project from a second aperture in a top side of the utility knife.

A first linkage and a second linkage combine the blade holder to the handle, which together create a four-bar mechanism that enables the blade holder to move in its curvilinear path between the respective positions. The blade holder can have a slot with a vertical portion and a horizontal portion, which cooperate to provide the blade holder with the ability to move in the curvilinear path with respect to the handle by providing a space for a button assembly to travel. The button assembly pushes the blade holder between the retracted position and the extended position and the blade holder moves with respect to the button assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring tow to the drawings which form a part of this original disclosure:

FIG. 1 is a left-side perspective view of a utility knife according to an embodiment of this disclosure and showing the blade in an extended position.

FIG. 2 is an exploded view of the utility knife of FIG. 1.

FIG. 3a is a left-side cut-away view of the utility knife of FIG. 1 with the blade in a retracted position.

FIG. 3b is a left-side cut-away view of the utility knife of FIG. 1 with the blade in an intermediate position.

FIG. 3c is a left-side cut-away view of the utility knife of FIG. 1 with the blade in a fully extended position.

FIG. 4a is a right-side cut-away view of the utility knife of FIG. 1 with the blade in a retracted position.

FIG. 4b is a right-side cut-away view of the utility knife of FIG. 1 with the blade in an intermediate position.

FIG. 4c is a right-side cut-away view of the utility knife of FIG. 1 with the blade in a fully extended position.

FIG. 5 is a left-side perspective view of the utility knife according to another embodiment of this disclosure and showing the blade in an extended position.

FIG. 6 is an exploded view of the utility knife of FIG. 5.

FIG. 7a is a left-side cut-away view of the utility knife of FIG. 5 with the blade in a retracted position.

FIG. 7b is a left-side view cut-away of the utility knife of FIG. 5 with the blade in an intermediate position.

FIG. 7c is a left-side view cut-away of the utility knife of FIG. 5 with the blade in a fully extended position.

FIG. 8a is a right-side view cut-away of the utility knife of FIG. 5 with the blade in a retracted position.

FIG. 8b is a right-side cut-away view of the utility knife of FIG. 5 with the blade in an intermediate position.

FIG. 8c is a right-side cut-away view of the utility knife of FIG. 5 in a fully extended position.

DETAILED DESCRIPTION OF THE DRAWINGS

FIGS. 1-4 illustrate a compact utility knife **100** constructed in accordance with the principles of the present disclosure. As shown in FIG. 1 knife **100**, includes a handle **102**, a blade holder **104** pivotally connected to handle **102** to move in a curvilinear path between an extended, operative position and a retracted, safety position, a trapezoidal utility blade **106** detachably mounted to the blade holder **104**, and a blade lock mechanism **107** for selectively locking the blade **106** onto blade holder **104**.

As shown in FIG. 2, handle **102** comprises left-side handle portion **102a** and right-side handle portion **102b** that are fastened together with suitable fasteners to hold between them a corresponding left-side plate **103a** and right-side plate **103b**. One or more spacers **105** positions left-side plate **103a** from right-side plate **103b** a sufficient distance apart so that blade holder **104** can extend out apertures in a front face and top side of handle **102**. A belt clip **110** may be fastened in any suitable manner to right-side handle portion **102b**. While the illustrated handle **102** comprises a variety of components, one or more of these components may be omitted without deviating from the scope of this disclosure.

Blade holder **104** comprises left and right blade holder portions **104a**, **104b** that are fastened to each other using rivets or other single fastening mechanisms (e.g., screws, integral formation, glue, welding, etc.). In another contemplated embodiment, blade holder **104** is a single, integrally formed member rather than two members secured together.

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Blade holder **104** includes blade lock mechanism **107** that is received in a slot in the top edge of blade holder **104** to selectively hold blade **106** in blade holder **104**. Blade lock assembly **107** includes a blade lock **108** biased by a biasing member to pivot between a blade-lock position and a blade-release position. To hold blade **106** in blade holder **104**, tab **109** on blade lock **108** is configured to align with a notch in blade **106**.

Utility blade **106** includes first and second parallel linear edges **106a**, **106b**, a mounting notch **106c** formed in first linear edge **106a**, and a cutting edge integral with second linear edge **106b**. When blade **106** is inserted in the slot in the front edge of blade holder **104**, the tab **109** on blade lock **108** engages mounting notch **106c** and locks utility blade **106** to blade holder **104**. When blade holder **104** is in an extended position, utility blade **106** extends out of the aperture in the front face of handle **102**. When blade holder **104** is in a retracted position, utility blade **106** is fully disposed in handle **102**.

As shown in FIGS. 3A-3C, blade holder **104** is pivotally combined to handle **102** to move about at least two axes in a curvilinear path between a retracted position (shown in FIG. 3A) and an extended position (shown in FIG. 3C). Blade holder **104** can be connected to handle **102** by means that is movable about at least two axes for connecting blade holder **104** to handle **102** for movement in a curvilinear path relative to handle **102** between a retracted position and an extended position. A first linkage **112** and a second linkage **114** are each combined to handle **102** at one end and to blade holder **104** at the other end to create a four-bar mechanism that controls the movement of blade holder **104**.

More specifically, first linkage **112** is fastened at its lower portion **118** with rivets **122** to right-side plate **103b** and second linkage **114** is fastened at its lower portion **120** with rivets **122** to right-side plate **103b**. First linkage **112** has an upper portion **124** that fastened with rivets **122** to blade holder **104** and second linkage **114** has an upper portion **128** that is similarly fastened with rivets **122** to blade holder **104**.

The four-bar mechanism is defined by first linkage **112** and second linkage **114** as the pivoting links. Second plate **103b**, and more specifically, an integral portion of second plate **103b** measured by the distance between lower portion **118** of first linkage **112** and lower portion **120** of second linkage **114**, define a fixed frame of the four-bar mechanism. Blade holder **104** and more specifically, an integral portion of blade holder **104** measured by the distance between upper portion **124** of first linkage **112** and upper portion **128** of second linkage **114**, define a floating link. This four-bar mechanism moves blade holder **104**, as shown in FIGS. 3A-3C and 4A-4c, in a curvilinear path between the fully retracted position and the fully extended position.

A button assembly **130** projects from left handle side **102a** to enable a user to easily move blade holder **104** between its respective positions. Button assembly **130** includes a button **132** which has on opposite sides a pair of protrusions **134**. Button **132** fits in a slot in a housing **136** and is biased outward by a spring (not shown) in the housing **136**, so that it projects outwardly from housing **136**. Housing **136** has a projection **138** that cooperates with a slot **140** in blade holder **104**. Slot **140** has a vertical portion **142** perpendicular to a horizontal portion **144**, which together provide a path of travel for projection **138** of housing **136**.

As blade holder **104** moves between its respective positions, button **132** of button assembly **130** moves across a slot **148** while projection **138** of button assembly **130** pushes blade holder **104**. More specifically, slot **148** includes aligned slots **148a**, **148b**, and **148c** in left handle side **102a**, left-side

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plate **103a**, and right-side plate **103b**, respectively, to secure button assembly **130** to both sides of handle **102**. As projection **138** pushes blade holder **104** as shown in FIGS. 3A-3C, the four-bar mechanism forces blade holder **104** to arc upwardly as the vertical portion **142** of slot **140** moves with respect to projection **138**. When blade holder **104** approaches its fully extended position projection **138** slides forward along horizontal portion **144** of slot **140**. FIGS. 4A-4C similarly show blade holder **104** moving between its respective positions. Thus, during extension and retraction of blade holder **104**, button **132** moves linearly across slot **148** of handle **102** as the button assembly **130** pushes blade holder **104**. As blade holder **104** moves, first linkage **112** and second linkage **114** pivot about their axes to move blade holder **104** in its curvilinear path.

Blade holder **104** can be locked in the retracted position and the extended position. Protrusions **134** on button **132** cooperate with a first notch **146a** and a second notch **146b** in slot **148** on left-side handle portion **102a**. In a retracted position, protrusion **134** on button **132** engages first notch **146a** to hold blade holder **104** in the retracted position. In an extended position, protrusion **134** engages second notch **146b** to hold blade holder **104** in the extended position. To unlock blade holder **104** and move blade holder **104** to an extended position, a user presses inward button **132** to disengage protrusion **134** from first notch **146a**. Button assembly **130** can then be slid across slot **148** to the engaged position where protrusion **134** of button **132** engages second notch **146b**.

FIGS. 5-8 illustrate another embodiment of a compact utility knife **200** constructed in accordance with the principles of the present disclosure. As shown in FIG. 5, knife **200**, includes a handle **202**, a blade holder **204** pivotally connected to handle **202**, a trapezoidal utility blade **106** detachably mounted to the blade holder **204**, and a blade lock mechanism **207** for selectively locking the blade **206** onto blade holder **204**.

As shown in FIG. 6, handle **202** comprises left side portion **202a** and right-side portion **202b** that are fastened together with suitable fasteners to hold between them a corresponding left-side plate **203a** and right-side plate **203b**. One or more spacers **205** positions left side plate **203a** from right-side plate **203b** a sufficient distance apart so that blade holder **204** can extend out apertures in a front face and top side of handle **202**. A bottom portion **209** and a rear portion **211** fit together beneath left-side plate **203a** and right-side plate **203b** to cover the bottom side of handle **202**. Rear portion **211** can be formed with an aperture **231**, so handle **202** can be connected to a key ring or the like. Bottom portion **209** is formed with a catch **213** to arrest blade holder **204**'s movement in the extended position. While the illustrated handle **202** comprises a variety of components, one or more of these components may be omitted without deviating from the scope of this disclosure.

Blade holder **204** comprises left and right blade holder portions **204a**, **204b** that are fastened to each other using rivets or other single fastening mechanisms (e.g., screws, integral formation, glue, welding, etc.). In another contemplated embodiment, blade holder **104** is a single, integrally formed member rather than two members secured together. Blade holder **204** has a hook **215** positioned on its rear side to cooperate with catch **213** on bottom portion **209** of handle **202**. As blade holder **204** is moved to the engaged position, its movement is arrested by the cooperation of hook **215** and catch **213**.

Blade holder **204** includes blade lock mechanism **207** that is received in a slot in the top edge of blade holder **204** to selectively hold blade **206** in blade holder **204**. Blade lock

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mechanism 207 includes a blade lock 208 biased by a biasing member to pivot between a blade-lock position and a blade-release position in a manner similar to the manner described for blade lock mechanism 107. Similarly, to hold blade 206 in blade holder 204, a tab on blade lock 208 is configured to align with a notch in blade 206. Blade 206 is constructed in a manner similar to blade 106.

As shown in FIGS. 7A-7C, blade holder 204 is pivotally combined to handle 202 to move in a curvilinear path between a retracted position (shown in FIG. 7A) and an extended position (shown in FIG. 7C). A first linkage 212 and a second linkage 214 are combined to handle 202 at one end and to blade holder 204 at the other end to create a four-bar mechanism that controls the movement of blade holder 204.

More specifically, first linkage 212 is fastened at its lower portion 218 with rivets to right-side plate 203b and second linkage 214 is fastened at its lower portion 220 with rivets to left-side plate 203b. First linkage 212 has an upper portion 224 that is fastened with rivets 222 to blade holder 204 and second linkage 214 has an upper portion 228 that is similarly fastened with rivets 222 to blade holder 204.

The four-bar mechanism is defined by first linkage 212 and second linkage 214 as the pivoting links. Second plate 203b, and more specifically, an integral portion of second plate 203b measured by the distance between lower portion 218 of first linkage 212 and lower portion 220 of second linkage 214 define a fixed frame of the four-bar mechanism. Blade holder 204, and more specifically, an integral portion of blade holder 204 measured by the distance between upper portion 224 of first linkage 212 and upper portion 228 of second linkage 214 define a floating link. This four-bar mechanism moves blade holder 204, as shown in FIGS. 7A-7B, in a curvilinear path between the fully retracted position and the fully extended position.

A button assembly 230 projects from a top side of handle 202 to enable a user to easily move blade holder 204 between its respective positions. Button 232 is part of a button assembly 230. Button assembly 230 includes a housing 236 and a spring to bias outward button 232 from a slot in housing 236. Housing 236 is combined to a plate 238 and a guide 237, which cooperate with a slot 240 in blade holder 204. Slot 240 has a vertical portion 242 perpendicular to a horizontal portion 244, which together provide a path of travel for guide 237.

As blade holder 204 moves to the extended position, guide 237 moves across a slot 248 in left side plate 203a while plate 238 of button assembly 230 pushes blade holder 204. As plate 238 pushes blade holder 204, as shown in FIGS. 7A-7C, the four-bar mechanism forces blade holder 204 to arc upwardly as vertical portion 242 of slot 240 in blade holder 204 moves with respect to plate 238. When blade holder 204 approaches its fully extended position, plate 238 slides forward along horizontal portion 244 of slot 240 in blade holder 204.

As blade holder 204 moves to the retracted position, guide 237 moves across a slot 248 in left side plate 203a. A catch 237a grabs the side of slot 240 to pull blade holder 204 toward the retracted position. As catch 237a pulls blade holder 204, as shown in FIG. 8B, blade holder 204 arcs upwardly as vertical portion 242 of slot 240 in blade holder 204 moves with respect to catch 237a of guide 237. When blade holder 204 is in its fully retracted position, catch 237a of guide 237 holds blade holder 204 in position until button 232 releases protrusion 234 of button 232 from a first notch 246a in a slot 248 (discussed below).

FIGS. 8A-8C similarly show blade holder 204 moving between its respective positions. Thus, during extension and retraction of blade holder 204, button 232 moves generally

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linearly across the top of handle 102 as the plate 238 pushes blade holder 204. As blade holder 204 moves, first linkage 212 and second linkage 214 pivot about their axes to move blade holder 204 in its curvilinear path.

Blade holder 204 can be locked in the retracted position and the extended position. Protrusion 234 on button 232 cooperates with a first notch 246a and a second notch 246b in a slot 248 on left side plate 203a. In a retracted position, protrusion 234 on button 232 engages first notch 246a to hold blade holder 204 in the retracted position. In an extended position, protrusion 234 engages second notch 246b to hold blade holder 204 in the extended position. To unlock blade holder 204 and move blade holder 204 to an extended position, a user presses inward button 232 to disengage protrusion 234 from first notch 246a. Button assembly 230 can then be slid across slot 248 to the engaged position where protrusion 234 of button 232 engages second notch 246b.

Various aspects of any of the embodiments can be combined in different combinations than the ones shown to create new embodiments that fall within the scope of the appended claims.

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it should be understood by those of ordinary skill in the art that various changes, substitutions and alterations can be made herein without departing from the scope of the invention as defined by appended claims and their equivalents. The invention can be better understood by reference to the following claims. For purpose of claim interpretation, the transitional phrases “including” and “having” are intended to be synonymous with the transitional phrase “comprising.”

What is claimed is:

1. A utility knife, comprising:

a handle;

a blade holder connected to the handle by means that is movable about at least two axes for connecting the blade holder to the handle for movement in a single curvilinear path relative to the handle between a retracted position and an extended position;

a button assembly that is moveable along a transverse linear path with respect to the handle and that cooperates with the blade holder to move the blade holder to the extended position; and

a utility blade replaceably attached to the blade holder for selective removal and replacement of the utility blade.

2. The utility knife of claim 1, wherein the handle further comprises a first aperture from which the blade holder projects in the extended position.

3. The utility knife of claim 2, wherein the handle further comprises a second aperture from which the blade holder projects as it is moved between the retracted position and the extended position.

4. A utility knife, comprising:

a handle including a right side, a left side, a front face, and a top side, and a first aperture and a second aperture;

a blade holder connected to the handle by means that is movable about at least two axes for connecting the blade holder to the handle for movement in a curvilinear path relative to the handle between a retracted position and an extended position;

a utility blade replaceably attached to the blade holder for selective removal and replacement of the utility blade, wherein the first aperture is in the front face from which the blade holder projects in the extended position and the second aperture is in the top side from which the blade holder projects as it is moved between the retracted position and the extended position.

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5. The utility knife of claim 4, wherein the blade holder further comprises a slot having a vertical portion perpendicular to a horizontal portion, which cooperate to provide the blade holder with ability to move in the curvilinear path with respect to the handle.

6. The utility knife of claim 5, the utility knife further comprises a button assembly that cooperates with the slot in the blade holder, wherein the button assembly pushes the blade holder to the extended position and the blade holder moves with respect to the button assembly.

7. A utility knife, comprising:

a handle;

a blade holder connected to the handle by means that is movable about at least two axes for connecting the blade holder to the handle for movement in a curvilinear path relative to the handle between a retracted position and an extended position with a top surface of the blade holder maintaining a substantially consistent perpendicular orientation with respect to a right side of the handle; and
a utility blade replaceably attached to the blade holder for selective removal and replacement of the utility blade.

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8. The utility knife of claim 7, wherein the handle further comprises a first aperture from which the blade holder projects in the extended position, a second aperture from which the blade holder projects as it is moved between the retracted position and the extended position, the right side, a left side, a front face, and a top side, wherein the first aperture is in the front face and the second aperture is in the top side.

9. The utility knife of claim 8, wherein the blade holder further comprises a slot having a vertical portion perpendicular to a horizontal portion, which cooperate to provide the blade holder with ability to move in the curvilinear path with respect to the handle.

10. The utility knife of claim 9, and further comprising a button assembly that cooperates with the slot in the blade holder, wherein the button assembly pushes the blade holder to the extended position and the blade holder moves with respect to the button assembly.

11. The utility knife of claim 7, and further comprising at least two axes about which the blade holder is pivotally attached to the handle.

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